

2022 ANNUAL REPORT of the COOMET TC 1.8 “Physical Chemistry”

1 General description of cooperation in the subject field

Activities of the COOMET Technical Committee 1.8 “Physical Chemistry” cover measurement services related to the field of Metrology in Chemistry and Biology.

COOMET TC 1.8 Members

The following 24 NMIs from 17 COOMET member countries are represented in TC 1.8: AzMI (Azerbaijan); CJSC "NBSM" (Armenia); BelGIM (Belarus); BIM (Bulgaria), IMBIH (Bosnia and Herzegovina); PTB and BAM (Germany); GEOSTM (Georgia); KazStandard (Kazakhstan); CSM (Kyrgyzstan); INIMET (Cuba); FTMC (Lithuania); INM (Moldova); NIM (China); TUBITAK UME (Turkey); VNIIM, VNIIFTRI, UNIIM – branch of VNIIM, VNIIOFI, VNIIMS (Russia); SMU (Slovakia); Tajikstandart (Tajikistan); Ukrmetrteststandart (Ukraine)*; and UzNIM (Uzbekistan).

**Note - in October 2022, a notification was received from the Ministry of Economy of Ukraine on the suspension of participation in the SOC.*

The TC has the following subcommittees:

- SC 1.8.1 “Electrochemistry”,
- SC 1.8.2 “Metals and alloys”,
- SC 1.8.3 “Inorganic analysis”,
- SC 1.8.4 “Gas analysis”,
- SC 1.8.5 “Organic analysis”,
- SC 1.8.6 “Bio analysis”,
- SC 1.8.7 “Characterization of particles”,
- SC 1.8.8 “Isotope analysis”.

Priority activities of TC 1.8 are the following:

- Climate change and clean air,
- Energy efficiency,
- Metrology in medicine, and
- Food safety.

In 2022 TC 1.8 “Physical Chemistry” had the following main areas of activities:

- Organization and carrying out of works on preparing CMC data of the COOMET member countries' NMIs – signatories to the CIPM MRA,
- Organization and carrying out of an internal review of CMCs of COOMET NMIs, as well as the interregional CMC review of institutes from other RMOs,
- Planning and organization of international comparisons and interlaboratory research,
- Familiarizing of TC 1.8 members with the CCQM and COOMET documents aimed at the realization of the CIPM MRA provisions and ensuring of the traceability of measurement results,

- Improvement of the TC 1.8 structure, and
- Provision of metrological services in the field of physical and chemical measurements.

2 TC 1.8 Projects

The COOMET member countries' NMIs with sufficient standard instruments, as well as interested metrological centers and designated laboratories of other countries take part in the TC projects related to international comparisons and pilot studies. At present, VNIIM, UNIIM – branch of VNIIM, and VNIIOFI coordinate the TC's projects.

VNIIM coordinates the following projects:

- COOMET project 611/RU-a/13: Pilot comparison “Melamine in milk powder”. Participants: VNIIM, UNIIM – branch of VNIIM, Ukrmetrteststandart. Final report is prepared.
- COOMET Project 772/RU-a/18: Key comparison “Carbon dioxide in Air at urban level (480-800) $\mu\text{mol/mol}$ ”. Participants: VNIIM, BelGIM, Ukrmetrteststandart, KazStandard, NMC/A*STAR, (Singapore). Final report is prepared.
- COOMET Project 864/RU/22: Key comparison “Motor vehicle emissions”. Participants: VNIIM, BelGIM, KazStandart. Protocol is prepared and approved.
- COOMET Project 824/RU/21: Pilot comparison “Sulfur in isooctane”. Participants: VNIIM, NIM (China), IMBIH (Bosnia and Herzegovina). Draft B is prepared.
- COOMET Project 775/RU-a/19: Pilot comparison “Electric conductivity of 25 S/m and 10 $\mu\text{S/cm}$ potassium chloride solutions”. Participants: VNIIM, UNIIM – branch of VNIIM, GEOSTM, BelGIM, NIM (Moldova), KazStandard, OOO “Sibprompribor-Analit”. Draft B report was prepared and sent to the participants.

UNIIM – branch of VNIIM coordinates the following projects:

- COOMET Project 849/RU/21: Pilot comparison “Mass fraction of metals (Cu, Zn, Mg, Fe, Ni, Sr, Cd, Pb) in blood serum”. Participants: UNIIM – branch of VNIIM, VNIIOFI, Ukrmetrteststandart. Measurements are completed. Final report is being prepared.
- COOMET 865/RU/22: Pilot comparison “Mass fraction of carbon and sulfur in steel”. Participants: UNIIM – branch of VNIIM, others. Form is prepared and the comparison is registered.

VNIIOFI coordinates the following projects:

- COOMET Project 806/RU-a/20: Pilot comparison “Mass fraction of aluminum in pure aluminum”. Participants: VNIIOFI, Ukrmetrteststandart, BAM (Germany), TÜBİTAK UME (Turkey). Comparison is rescheduled due to issues with logistics of transporting samples.
- COOMET Project 807/RU-a/20: Pilot comparison “Mass fraction of Mg in pure magnesium”. Participants: VNIIOFI, Ukrmetrteststandart, BAM (Germany). Comparison is rescheduled due to issues with logistics of transporting samples.
- COOMET Project 808/RU-a/20: Pilot comparison “Mass fraction of Ni in pure nickel”. Participants: VNIIOFI, Ukrmetrteststandart, BAM (Germany), TÜBİTAK UME (Turkey). Comparison is rescheduled due to issues with logistics of transporting samples.
- COOMET Project 809/RU-a/20: Pilot comparison “Mass fraction of Ti in pure titanium”. Participants: VNIIOFI, UNIIM-branch of VNIIM, Ukrmetrteststandart, BAM (Germany). Comparison is rescheduled due to issues with logistics of transporting samples.

TC 1.8 Planned projects

| Coordinating NMI | Project | Comparison type |
|------------------|--|-------------------------|
| VNIIM | Quantitative determination of human DNA | COOMET Pilot comparison |
| VNIIM | Isotope composition of alcohol | COOMET Pilot comparison |
| VNIIM | Concentration of copies of the bacterial genome of mycoplasma | COOMET Pilot comparison |
| VNIIFTRI | pX measurements of sodium ions activity at $pNa \approx 1.1$ | COOMET Pilot comparison |
| VNIIFTRI | pH measurements of oxalate buffer solution at $pH \approx 1.65$ | COOMET Pilot comparison |
| VNIIFTRI | pH measurements of phosphate buffer solution at $pH \approx 7.0$ | COOMET Key comparison |
| NIM | Inorganic and organic chlorides in crude oil | COOMET Pilot comparison |

3 Results of the last TC 1.8 meeting

The last meeting of COOMET TC 1.8 "Physical Chemistry" was held on October 28 – 29, 2021 in St. Petersburg, Russia, in D.I. Mendeleev Institute for Metrology.

27 representatives of the following NMIs attended the meeting: BelGIM (Belarus), Ukrmetrteststandart (Ukraine), KazStandard (Kazakhstan), NIM (China), Tajikstandart Agency (Tajikistan), UzNIM (Uzbekistan), VNIIM, UNIIM — branch of VNIIM, VNIIOFI, VNIIFTRI, VNIIMS (Russia), as well as the COOMET Secretariat.

The following reports were made:

- on resolutions of the COOMET Committee and COOMET Presidential Council,
- information from the TC 1.8 representatives – members of the CCQM WGs on participation in the activities of the Consultative Committee and its Working Groups and its strategy,
- on the realization of program COOMET P6/2021 "COOMET Roadmap on implementation of decisions related to the redefinition of the basic units of the International System of Units SI for 2020–2024",
- on the transition of COOMET member countries to new editions of ISO/IEC 17025:2017 and ISO 17034:2016, and
- reports from the TC 1.8 Members who are representatives of Ukrmetrteststandart, BelGIM, KazStandard, Tajikstandart, and UzNIM on the state of affairs in their NMIs.

The Chairs of the TC 1.8 subcommittees presented the results of the ongoing COOMET comparison projects.

4 Cooperation with international and regional organizations

CCQM

TC 1.8 representatives are involved in the CCQM activities almost since its creation, and participate in work of the following working groups: WG on Key Comparisons (CCQM-KCWG); WG on Organic Analysis (CCQM-QAWG); WG on Gas Analysis (CCQM-GAWG); WG on Inorganic Analysis (CCQM-

IAWG); WG on Bio Analysis (CCQM-BAWG), WG on Electrochemical Analysis (CCQM-EAWG); WG on Cell Analysis (CCQM-CAWG); WG on Nucleic Acid Analysis (CCQM-NAWG); WG on protein Analysis (CCQM-PAWG); WG on Surface Analysis (CCQM-SAWG); and WG on Isotope Analysis (CCQM-IRWG).

APMP

VNIIM (Russia) has been the APMP Full Member since 2008, KazStandard (Kazakhstan) and UzNIM are the Associate Members of this RMO. Representatives of these NMIs took part in the APMP General Assembly held on November 1–2, 2022. VNIIM also participated in the TCQM and TCMM APMP annual meeting (November 14–16, 2022).

Since 2021, VNIIM and NIM carry out COOMET bilateral pilot comparison on measurements of sulfur content in isooctane.

EURAMET

Cooperation with the EURAMET TC Metchem consists mainly of participation in the international comparisons and realization of bilateral agreements with NMIs of the EURAMET member states. VNIIM also participates in the EMPIR project in the field of stable carbon isotope metrology.

SIM

Cooperation with SIM is conducted primarily in the framework of participation in international comparison projects.

ISO TCs

TC 1.8 representatives participated in development of standards and carried out expert reviews of ISO TC 158 (Gas analysis), ISO TC 69 (Applications of statistical methods), and ISO TC 212 (Clinical laboratory testing and *in vitro* diagnostic test systems).

OIML

VNIIM and VNIIFTRI representatives head OIML TC 17 “Instruments for physico-chemical measurements” and its subcommittees (SC 2 “Saccharimetry”, SC 3 “pH-metry”, SC 4 “Conductometry”, SC 5 “Viscosimetry”, SC 6 “Gas Analysis”), and participate in development and expert review of OIML publications.

5 Implementation of the CIPM MRA

CMCs related activity

XXIIIth cycle of the COOMET CMC review was completed. The results were published in the international base of BIPM KCDB, namely the following.

To date, the BIPM KCDB contains 621 CMCs of VNIIM (including UNIIM), 17 CMCs of VNIIFTRI, 42 CMCs of Ukrmetrteststandart*, 26 CMCs of BelGIM, and 9 CMCs of KazStandard in the field of Chemistry and Biology.

COOMET CMCs’ distribution by measurement categories is as follows: Gases – 465, Organic solutions – 7, Inorganic solutions – 29, Metals and alloys – 14, Sediments, soils, ores, and particulates – 21, High purity chemicals – 70, Biological fluids and materials – 9, Food – 18, Water – 13, Electrolytic conductivity – 28, Advanced materials – 29, Other materials – 10.

With regard to the CMCs of a new XXIV cycle, the situation is as follows.

The intraregional review is completed, and the interregional review is soon to begin. In the new cycle, the following CMCs were claimed:

VNIIM:

- Gases: 5 new, 51 reviewed.

BelGIM:

- Gases: 5 new.

KazStandart:

- Gases: 2 new.

Ukrmetrteststandart:

- Gases: 2 new,
- Electrolytic conductivity: 3 new.

Experts: representatives of VNIIFTRI, VNIIM, UNIIM – branch of VNIIM, Ukrmetrteststandart, and BelGIM take part in the interregional review.

** Note: Starting February 1, 2023, NMIs and DIs of Georgia and Ukraine are carrying out their CIPM MRA related activities through EURAMET. AT the request of Ukrmetrteststandart, within the framework of the XXIV cycle, the intra-regional review was carried out within COOMET and then submitted to the inter-regional review on behalf of COOMET.*

Participation of COOMET NMIs in the CCQM comparisons

Participation of COOMET active members in international pilot and key comparisons is organized.

In 2022:

VNIIM participated in most of the CCQM comparisons in the field of gas analysis (8 comparisons), isotope analysis (3 comparisons), organic analysis (7 comparisons), inorganic analysis (4 comparisons), CCQM-NAWG (4 comparisons), and CCQM-CAWG (3 comparison).

VNIIFTRI planned to participate in 6 comparisons, including 2 comparisons in the field of quantity and number concentration of particles, 1 comparison in the field of inorganic analysis, and 3 comparisons in the field of electrolytic conductivity. However, due to issues with logistics of transporting samples, 4 comparisons were not carried out. VNIIFTRI co-coordinates the CCQM-K19.2018 comparison “pH measurement of borate buffer solutions at pH ~9,18” with the National Metrology Institute of Japan (NMIJ).

UNIIM – branch of VNIIM participated in 2 CCQM-IAWG comparisons, 1 CCQM-EAWG comparison, 1 CCQM-IRWG comparison, and 1 CCQM-SAWG comparison. UNIIM – branch of VNIIM coordinated and co-coordinated 2 CCQM key comparisons in the field of surface analysis (CCQM.K172) and inorganic analysis (CCQM.K173).

VNIIMS participated in 1 CCQM-NAWG comparison related to SARS-CoV-2.

6 Meetings and events

On July 14–15, 2022, a Russian-Chinese online seminar “Metrology in Chemistry and Healthcare” was organized. The Russian side was represented by the specialists of D.I. Mendeleev Institute for Metrology, VNIIMS, VNIIFTRI, and VNIIOFI. The Chinese side was represented by the experts from The State Administration for Market Regulation (SAMR) and National Institute of Metrology of China (NIM).

On September 13–16, 2022, the V International Scientific Conference “Reference Materials in Measurements and Technology” was held in Yekaterinburg. The event was dedicated to the 180th anniversary of the D.I. Mendeleev Institute for Metrology and 80th anniversary of the Ural Research Institute of Metrology. The conference was attended by the representatives from Rosstandart and federal government agencies, as well as by scientists, teachers and graduate students of universities, specialists from research and scientific metrological institutes, regional centers of metrology, enterprises and organizations of the industrial sector. In total 211 experts from 20 regions of the Russian Federation, as well as from Azerbaijan, Belarus, Israel, Kazakhstan, and Uzbekistan took part in the conference.

On October 13–14, 2022 the 11th meeting of the Working subgroup on metrological assurance of energy resources accounting of the Permanent Russian-Chinese Working Group on standardization, metrology, conformity assessment, and inspection control were held via videoconference. The Russian side was represented by the specialists of Rosstandart, D.I. Mendeleev Institute for Metrology, VNIIR, and VNIIMS. The Chinese side was represented by the experts from The State Administration for Market Regulation (SAMR), National Institute of Metrology of China (NIM), and Nanjing National Station for Oil and Natural Gas Flow Measurement.

7 Information on the expected venue and date of the next TC 1.8 meeting

The next meeting of TC 1.8 “Physical Chemistry” will be held in May 2023 at VNIIM (St. Petersburg, Russia) in a hybrid format.

Chair
COOMET TC 1.8 “Physical Chemistry”



Prof. L.A. Konopelko

Deputy Chair
COOMET TC 1.8 “Physical Chemistry”



Y.A. Kustikov